

REMARKS

Claims 1-5, 8-16 and 18-57 are pending, with claims 19-57 withdrawn from consideration. By this Amendment, no claims are cancelled, no claims are amended and no new claims are added.

**Claim Rejections – 35 U.S.C. § 103**

In the December 20, 2010 Office Action, claims 1-5, 8, 9, 16 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent 4,888,316 to Gardner et al., claims 1-5, 8, 9, 18 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Gardner et al. in view of U.S. Patent Publication US2006/0167119 to Leng et al., claims 10-12 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Gardner (taken alone or in view of Leng as necessary) in view of U.S. Patent 6,255,358 to Singleton et al., and claims 13-15 stand rejected under 35 U.S.C. § 103 as being unpatentable over Gardner (taken alone or in view of Leng as necessary) in view of U.S. Patent 3,988,263 to Hansford. Applicants respectfully traverse the rejections as a *prima facie* case of obviousness has not been established.

Independent claim 1 is directed to an impregnated and calcined catalyst for use in a Fischer-Tropsch (“F-T”) synthesis reaction, the catalyst comprising cobalt supported on alumina, in which the catalyst average particle size is in the range 20 to 100  $\mu\text{m}$ , the specific surface area of the impregnated and calcined catalyst particles is greater than  $120 \text{ m}^2/\text{g}$ , the average pore size of the impregnated and calcined catalyst is at least  $90\text{\AA}$  (9nm), the pore volume of the impregnated and calcined catalyst is at least  $0.45 \text{ cm}^3/\text{g}$ , and the cobalt content of the catalyst is from 10 to 40% by weight.

In each of the rejections of independent claim 1 under 35 U.S.C. § 103(a), the Office Action relies upon Gardner either alone, or in combination with Leng for the particle size limitation, to meet each of the limitations of the claimed impregnated and calcined catalyst. One of ordinary skill in the art will appreciate that catalysts are very seldom, if ever, developed as a general purpose catalyst. The main reason for this being that a highly attractive feature of a catalyst for one particular reaction, such as a F-T synthesis, or particular technical environment, e.g. type of reactor and other process parameters, may be less favorable, irrelevant, or even detrimental in another context.

To this point, there is no mention of F-T reactions or of a syngas feed in Gardner. In stark contrast, Gardner is specifically directed towards a reconditioned “hydrotreating catalyst to be used in a process for hydrotreating hydrocarbon containing feed streams (oils) which contain metal impurities.” (Abstract.) In fact, the written description of Gardner states, “Suitable hydrocarbon containing feed streams include crude oils and fractions thereof, petroleum products, heavy oil extracts, coal pyrolyzates, liquefied coal products, products from tar sands, shale oil and shale oil products.” (Col. 5, ll. 63-67.) Gardner goes on to state that “[t]he catalyst composition of this invention is particularly suited for treating petroleum residua such as heavy topped crudes and hydrotreated heavy oil residua, which generally have an initial boiling point (measured under atmospheric pressure) in excess of about 400°F., preferably in excess of about 600°F., and contain about 5-1000 ppmw (parts by weight of metal per million parts of weight of hydrocarbon-containing feed) vanadium, about 3-500 ppmw nickel, about 0.5-7.0 weight-% sulfur, about 0.2-2.0 weight-% nitrogen and about 1-30 weight-% Ramsbottom carbon residue.”

(Col. 5, l. 67 – Col. 6, l. 10.) Thus, it is clear that the catalyst described in the disclosure of Gardner was developed specifically for the purpose of hydrocarbon processing.

“In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.” MPEP 2141.02 (V) *citing Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenk v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983). Further, “A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.” MPEP 2141.03 (VI) *citing W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 202 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). When properly considered in its entirety (i.e., as a whole), there are numerous instances in Gardner that teach away from F-T catalysts.

As discussed above, Gardner teaches hydrocarbon conversion processes, such as treating petroleum residua such as heavy topped crudes and hydrotreated heavy oil residua, which generally have an initial boiling point (measured under atmospheric pressure) in excess of about 400°F., preferably in excess of about 600°F. This disclosure in Gardner teaches away from F-T processes. One of ordinary skill in the art will appreciate that in an F-T process the conversion of synthesis gas, which mainly comprises carbon monoxide and hydrogen, has much lower boiling points than those described in Gardner.

Also, Gardner teaches that platinum, palladium and other Group VIII noble metals and compounds thereof are essentially *absent* from the fresh catalyst composition, which after the fresh catalyst is spent comprises the underlying catalyst material of the reconditioned catalyst.

(Col. 3, ll. 15-17.) One of ordinary skill in the art will appreciate that platinum, palladium and other Group VIII noble metals are commonly used as promoters in F-T processors.

Further, Gardner discloses that the reconditioned catalyst “is particularly suited for treating residua such as heavy topped crudes and hydrotreated heavy oil residua...contain[ing] about 5-1000 ppmw (parts by weight of metal per million parts of weight of hydrocarbon-containing feed) vanadium, about 3-500 ppmw nickel, about 0.5-7.0 weight-% sulfur...” Again, one of ordinary skill in the art will appreciate that F-T catalysts are sensitive to poisoning by sulfur-containing compounds, and sensitivity of the catalyst to sulfur is greater for cobalt-based F-T catalysts than their iron counterparts.

Still further, in the Response to Arguments section, the Examiner states Gardner’s catalyst can be employed in slurry-phase processes. (citing Col. 6, ll. 12-27.) Respectfully, the portion of Gardner cited by the Examiner not only recites the catalyst being in intimate contact “with the hydrocarbon containing feed stream” discussed above, but the particular catalyst beds disclosed pertaining to using the catalyst in these oil feed streams.

Still even further, Gardner teaches that the calcined shaped catalyst composition is “oxidized.” (Col. 5, ll. 48-60.) Gardner also more specifically discloses that “[h]eating step (d) is carried out in under oxidizing conditions...so as to oxidize the carbonaceous deposits on the spent catalyst component to carbon oxides (CO<sub>2</sub> and/or CO), and to substantially *convert metal sulfides to metal oxides.*” (Col. 4, ln. 59-64.) For a catalyst composition to function at all as an F-T synthesis reaction catalyst, the catalytically active metal would have to be in an activated state, that is to say its metallic state, and not the oxidized state. Moreover, besides hydrotreating

catalysts being produced in their oxidized state, these catalysts are normally pre-sulfided, as indicated in the foregoing passage of Col. 4, ln. 59-64, which further makes the Gardner catalysts inappropriate for use as an F-T synthesis reaction catalyst.

From at least the foregoing, it is clear that Gardner is directed to hydrocarbon conversion processes and teaches away from F-T synthesis processes. One of ordinary skill in the art will appreciate that there are substantive differences between F-T synthesis of hydrocarbon and the hydrocarbon processing methods taught in Gardner. Because of these substantive differences and Gardner itself teaching away from F-T catalysts, it is unreasonable to assert that one of ordinary skill in the art would identify Gardner as a primary reference in the art of F-T catalysts. Gardner simply does not even belong in the category of literature sources for F-T catalysts, which is quite voluminous, as the art of F-T catalysts is quite different from the hydrogen processing catalysts. Accordingly, the Examiner's obviousness rejection of independent claim 1 based upon Gardner alone is in error. One of ordinary skill in the art, when properly considering Gardner in its entirety, would not look to Gardner with the purpose of modifying the particle size limitation, much less optimization of the particle size, for an F-T catalyst. In other words, there is no reasonable basis for one of ordinary skill in the art to modify the Gardner catalyst directed at hydrocarbon conversion processes into an F-T catalyst as provided in the present invention. "Optimization" of the particle size limitation cannot go in the opposite direction taught by Gardner, other than being asserted upon improper hindsight based upon the teachings of Applicants' invention.

Additionally, Gardner teaches that the “[m]etal promoter weight percentages in the calcined catalyst composition generally are in the range of about 0.5 to about 10 weight-% metal (i.e., Mo or W or Ni or Co, or mixture of two or more of these metals), preferably about 2-6 weight-% metal.” (Col. 5, ll. 39-44.) In other words, Gardner teaches one of ordinary skill in the art that the catalyst for the hydrocarbon conversion process preferably contains about 2-6 weight-% metal, such as cobalt. In fact, Example I in Gardner teaches that the catalyst composition contains about 0.6 weight-% cobalt and 1.7 weight-% molybdenum. (Col. 8, ll. 55-57.) Thus, the claimed invention as a whole is not obvious as there are substantial differences between the claimed catalyst and the catalyst taught in Gardner.

Still further, the Examiner admits that Gardner does not explicitly teach an average catalyst particle size within the claimed range of independent claim 1. Instead, the Examiner speculates that an appropriate fresh particle’s size is either approximately the size of the ground spent catalyst (40-250 mesh size) or smaller, since the catalyst acquires impurities and is thus enlarged during the fouling process. Respectfully, Gardner discloses the reconditioned catalysts being intended for use in hydrotreating operations and specifically states:

The pasty mixture obtained in step (b) can be shaped in step (c) by any conventional shaping process, such as extrusion through at least one die (round or square or trilobal and the like) and subsequent cutting the extruded strand(s), or by pelletizing (using a disc pelletizer or a press or any other conventional pelletizing equipment), and the like. Generally, the size of the thus shaped particles is such as to provide particles in subsequent heating step (d) of such size as to make them suitable for use in fixed catalyst beds, as is well known by those skilled in the art.

(Col. 4, ln. 33-43.) This passage suggests that the appropriate size of catalysts in hydrotreating operations is larger, not smaller, than the ground size of the spent catalyst. The Examiner's conclusory argument regarding the catalyst particles size fails to appreciate the hydrotreating catalyst technology and is merely conclusory without a sufficient underlying basis. Also, as discussed above, the Examiner's basis for adjusting the size of Gardner's particles to an appropriate size for an F-T catalyst is in error. Accordingly, based upon the foregoing and contrary to the Examiner's arguments, Gardner actually teaches away from an F-T synthesis reaction catalyst, and the assertion that the catalysts in Gardner would be suitable for an F-T synthesis would render the Gardner reference unsatisfactory for its intended purpose, which is for hydrocarbon processing of oil feed streams.

It was also error for the Examiner to conclude that it would be obvious to modify Gardner's catalyst by employing a particle size as taught by Leng. As discussed above, the Gardner catalyst is directed to a hydrotreating catalyst for hydrocarbon processing methods on oil feed streams, which teaches away from catalysts for F-T synthesis. In stark contrast, Leng is directed towards F-T reactions combined with hydrocracking or isomerisation processors that utilize a mixed particulate catalyst comprising a mixture of a particulate F-T catalyst and a particulate hydrocracking and/or isomerisation catalyst. (Abstract.) Accordingly, one of ordinary skill in the art, when properly considering Gardner and Leng in their entirety, would not modify the particle size of the catalyst in Gardner in view of the F-T catalyst in Leng.

Moreover, “[i]t is improper to combine references where the references teach away from their combination.” MPEP 2146 (D)(2); *citing In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). As discussed above, Gardner teaches that platinum, palladium and other Group VIII noble metals and compounds thereof are essentially *absent* from the fresh catalyst composition, which after the fresh catalyst is spent comprises the underlying catalyst material of the reconditioned catalyst. (Col. 3, ll. 15-17.) This teaching teaches away from Leng, which teaches that “[p]romoters may be added to the catalyst and are well known in the Fischer-Tropsch catalyst art. Promoters can include ruthenium, platinum or palladium... Preferred promoters are rhenium and hafnium.” (para. [0037].) Accordingly, the Examiner’s reliance on Leng to modify the catalyst in Gardner is improper, and can only be based upon improper hindsight of the Applicants’ claimed invention.

Thus, a *prima facie* case of obviousness has not been established, as the cited references, individually or in combination, are not suitably modified or combined to teach or suggest all of the features included in independent claim 1. If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending therefrom is non-obvious. *In re Fine*, 837, F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, Applicants are not presenting additional arguments with respect to the patentability of the dependent claims, although Applicants do not acquiesce to any of the rejections and reserve the right to raise additional arguments with respect to the patentability of such claims. As all remaining pending claims depend directly or indirectly from one of the subject claims, Applicants respectfully request that the rejections under § 103 be withdrawn. Also, because a *prima facie* case of obviousness has not been established, Applicants do not comment further here on the suitability of combining or modifying the cited

references. Thus, Applicants respectfully request reconsideration and withdrawal of these rejections.

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,



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